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Policy implications of budget deficit targets

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Policy Implications of Budget Deficit Targets

Abstract

I analyze in this paper a financial program found commonly in developing countries that are engaged in improving structural imbalances. Similar programs have also been adopted in industrialized countries, in the U.K. since 1980 and in the U.S. since 1984. A typical financial program consists of a target budget deficit, an independent monetary (domestic credit) policy, and the government budget constraint. For such a program, I show that the endogeneity of the issuance of nominal bonds is not sufficient to satisfy both the government budget constraint and the deficit target. Such a program is feasible provided bonds are issued endogenously to satisfy the deficit target and either lump sum taxes and/or discretionary spending are adjusted endogenously to satisfy the budget constraint. Lump sum taxes are not dissimilar from U.K. government receipts from North Sea oil and gas production or proceeds from selling government assets. In the absence of ready access to such receipts, if taxes are not raised and/or spending is not cut, the policy package will be infeasible as the government budget constraint cannot be satisfied.

Recent policy packages and the resulting fiscal performances in the U.K. and in the U.S. economies provide empirical support to the analytical result of this paper. In particular, bonds and discretionary government expenditure have been used as two endogenous policies satisfying the constraint on the budget deficit and the budget balance. In the case of the U.K., increased receipts from the production of North Sea oil and gas in the early 1980s provided a temporary alternative to reducing government spending.

Policy Implications of Budget Deficit Targets

1. Introduction

Fiscal authorities frequently react to macroeconomic imbalances by adopting policies aimed at reducing government budget deficits with a view to reducing aggregate demand and influencing other key variables in the economy.[1] Such authorities in a growing number of developing countries adopted reduced budget deficit targets in the late 1970s and the 1980s.[2] Deficit targets involving gradual reductions several years ahead were introduced voluntarily by the authorities in the U.K. and in the U.S. in the 1980s. The U.K. government under Mrs. Margaret Thatcher introduced deficit targets as part of its Medium Term Financial Strategy (MTFS) in the March 1980 budget. In the U.S., although formal deficit reduction targets over several years were enacted in 1985, a permanent statutory debt ceiling has existed since 1947. The cumulative effects of successive budget deficits meant that by 1958 the debt ceiling could not be satisfied without the U.S. Treasury reneging on some federal government obligations. As a result, between 1958 and 1985, U.S. Congress raised the statutory debt ceiling 45 times from an initial level of $275 billion to $2,078.7 billion. This rapid growth in the debt ceiling began to worry the U.S. Congress by mid-1980s. In 1984, Congress became concerned that the actual and projected high budgetary deficits as well as the debt-service ratio would

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[1] Economists differ in opinions on the precise macroeconomic effects of budget deficits. For a succinct discussion, see Yellen (1989).

[2] Between 1971 and 1988, 79 mainly developing country members of the International Monetary Fund (IMF) adopted economic programs averaging over five years in each country with the programs usually requiring a reduced ratio of government budget deficits to gross domestic product. These programs were in the form of standby and extended standby arrangement facilities of the IMF, for a total of 412 program years. The U.K. was the only major industrialized country to have had such facilities in three years (1975, 1977, and 1978). Data derived from IMF Survey (various issues).

jeopardize the economic recovery that began in the previous year. Initially, policies were adopted in the form of tax freeze which postponed 11 tax reductions scheduled to take effect in that year and in the subsequent years. In the following year, the Balanced Budget and Emergency Deficit Control Act of 1985 -- popularly known as the Gramm-Rudman-Hollings law -- was passed. This Act has been revised since, but the basic element of the law requires achieving successively lower projected budget deficit levels and a balanced budget now by 1993.

The deficit reducing programs have all had the following common features. In the developing countries, the International Monetary Fund (IMF) programs requiring reduced budget deficits usually also specify domestic credit ceilings, thereby controlling the economy's money supply.[3] In the U.K., the voluntary policy package introduced by the Thatcher government consisted of targeting both the budget deficit and the growth rate of money.[4] In the U.S., the government policy targets the budget deficit level. But, because the Federal Open Market Committee (FOMC) of the Federal Reserve System independently sets the monetary policy, the federal government must take the money supply as given exogenously. Thus, in all the examples of budget deficit targets, the fiscal authorities can decide to achieve the target and satisfy the government budget constraint by some combination of issuing bonds, raising tax rates that will generate higher tax revenue, or reducing discretionary government spending.

Examinations of the U.K. and U.S. data suggest that discretionary government expenditure has been *de facto* a second endogenous policy choice, in addition to endogenous bonds. Adoption of deficit reduction targets has

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[3]The relationship between domestic credit and the money supply is described in section 2.

[4]The monetary target was introduced with a view to reducing the domestic inflation rate.

contributed to trimming the budget deficit ratios in both countries (see Table 1). Reductions achieved in the U.K. economy are more drastic owing to the length of time over which the deficit reduction policies have been maintained. The deficit ratio has been reduced sharply from 4.6 percent of gross domestic product in 1980 to 0.8 percent in 1987. Because this measure of deficit exaggerates the underlying achievements, I adjust the reported deficits to exclude from revenue government asset sale proceeds and royalties received from oil and gas explorations to provide a better indication of the underlying trend in the budget deficit. Even the adjusted deficit ratio indicates that the authorities have maintained a successful budget deficit reduction program. The adjusted deficit ratio has been trimmed from 7.1 to 2.6 percent. Initially, because of improved tax performances owing to higher tax receipts from oil and gas-related productions, the government expenditure remained high. But, as the oil sector weakened in the more recent years, some expenditure cuts have also been made. In the U.S., the deficit ratio was 6.2 percent in 1983 but it was reduced to 3.3 percent in 1988.[5] This sharp reduction was accompanied by reduced government expenditure ratios and virtually unchanged tax performance. These fiscal outcomes lend empirical support to the theoretical result of this paper that successful deficit reductions are accompanied by reduced government spending when the monetary policy is exogenously set. In the case of the U.K., increased tax receipts from production of North Sea oil and gas in the early 1980s provided a temporary alternative to reducing government spending.

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[5] In the calculation of the deficit, operation of the Social Security Trust Funds have been consolidated with the central government. This is in conformity with their treatment in the U.S. budget presentation as well as with budget data for the U.K. discussed previously.

Table 1. Selected Consolidated Central Government Budgetary Data of the United Kingdom and the United States of America, 1974-88[1]

	Average for 1974-79	1980	1981	1982	1983	1984	1985	1986	1987	1988
	(In percent of gross domestic product)									
Total revenue and grants										
U.K.	34.4	36.0	36.9	39.3	38.1	38.3	38.1	38.1	37.5	...
U.S.A.	19.4	20.9	21.8	21.3	20.0	19.7	20.3	19.8	20.7	20.2
Tax revenue										
U.K.	30.0	31.0	31.9	34.2	33.1	33.5	33.5	34.0	33.4	...
U.S.A.	18.0	19.1	19.8	19.3	17.7	17.7	18.2	17.9	18.8	18.6
Other revenue and grants										
U.K.	4.4	5.0	5.0	5.1	5.0	4.8	4.6	4.1	4.1	...
U.S.A.	1.4	1.8	2.0	2.0	2.3	2.0	2.1	1.9	1.9	1.6
Total expenditure and net lending										
U.K.	39.8	40.6	41.6	42.7	42.5	41.5	41.3	40.0	38.3	...
U.S.A.	21.9	23.8	24.5	25.4	26.2	24.6	25.7	24.9	24.0	23.5
Of which: interest payments										
U.K.	3.5	4.1	4.2	4.0	4.0	4.1	4.1	4.1	4.0	...
U.S.A.	1.7	2.4	2.7	3.1	3.3	3.4	3.9	3.8	3.6	3.5
Overall deficits										
U.K.	-5.4	-4.6	-4.7	-3.4	-4.4	-3.2	-3.2	-1.9	-0.8	...
U.K. (adjusted)[2]	-7.2	-7.1	-6.8	-5.7	-6.5	-5.2	-5.2	-3.7[3]	-2.6[3]	...
U.S.A.	-2.5	-2.9	-2.7	-4.1	-6.2	-4.9	-5.4	-5.1	-3.3	-3.3
Memorandum items:										
Outstanding debt										
U.K. (end-March)	49.4	46.3	43.6	44.5	46.0	47.6	47.1	47.7	...	...
U.S.A. (end-of-period)	27.8	28.5	28.4	31.3	36.3	37.3	40.0	42.4	43.4	43.7
Gross domestic product										
U.K. (In billions of pounds)	137.9	230.6	254.8	277.2	302.0	321.4	353.7	377.5	408.6	...
U.S.A. (In billions of dollars)	1,849.3	2,619.0	2,937.3	3,088.3	3,273.2	3,647.0	3,909.2	4,153.3	4,407.8	4,759.6

Sources: International Monetary Fund, Government Finance Statistics Yearbook (1984, 1987, and 1989).

1 U.K. year-ending December 31, and U.S. year-ending June 30 through 1976 and September 30 thereafter.

2 Differs from the reported deficit in the previous line by the amount of asset sales and royalties, which is treated now as a special financing item rather than a source of government revenue.

3 Assumed royalties to remain at the 1985 level of U.K. £2.5 billion.

Literature on the government budget constraint has considered mainly the consequences of recognizing a government budget constraint in the standard macroeconomic models. A seminal paper by Blinder and Solow (1973), following the pioneering works of Ott and Ott (1965) and Christ (1967; 1968) earlier, established the fact that the government cannot independently set taxes and government spending and control the issuance of money and bonds to the private sector. The government budget constraint requires that one of these variables must be endogenously set. In a related literature, Tobin and Buiter (1976) have shown that constancy of real public spending inclusive of debt interest is compatible with the dynamic stability of pure bond finance.[6] This necessarily implies that the government gives up an additional degree of freedom to choose its policy variables independently. I make this point explicit by extending the standard government budget constraint literature with an additional constraint in the form of a target budget deficit. The deficit target ensures that the path of the real bond stock cannot explode because the target level implies a fixed path for government spending inclusive of interest payments. This is the crucial mechanism for dynamic stability in optimizing and *ad hoc* extended IS/LM models.

I show that the endogeneity of the issuance of nominal bonds is not sufficient to satisfy both the government budget constraint and the deficit target. Endogenous bonds will satisfy the deficit target, but an additional policy instrument must be used to satisfy the government budget constraint. If monetary growth rate is not also subject to a target, this will usually mean the

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[6]The usual result in dynamic IS/LM models with a Phillips curve is that constancy of real public spending inclusive of debt interest is compatible with stability of pure bond finance but not sufficient for it. The determinant of the relevant Jacobian matrix has the right sign for stability, but the sign of the trace is ambiguous.

government endogenously selects either tax rates, government spending, or the issuance of money to satisfy its budget constraint. In countries where the central bank independently sets the monetary policy, such as in the U.S., the choice is limited to endogenously choosing tax rates or government spending. Given also the limitations on governments to freely set the tax rates, the difficulty in the developing countries of improving tax collections through more efficient tax administration or altering nondiscretionary government spending, the only choice variable remains the discretionary part of government spending. Thus, a policy package involving a target budget deficit, an independent path for the money supply, and no tax increases requires the fiscal authorities to issue bonds and adjust discretionary government spending endogenously. The introduction of a budget deficit target requires now <u>two</u>, not <u>one</u>, endogenous government policy variables.

Although there has been no published literature dealing with the choice of government policies when budget deficits are targeted, policymakers and international monetary officials that advise governments to adopt policy packages involving deficit targets have been dealing with the issues as they have occurred. Clear understanding by the fiscal authorities of the implications of introducing and then maintaining such deficit targets will prevent unpleasant surprises. Recognition that maintaining low government budget deficits with a view to averting macroeconomic imbalances and providing conditions for sustained economic growth will require cuts in discretionary expenditure in order to balance the budget will provide a better environment for careful selection of expenditure programs. At present, countries with chronic needs for balance of payments support from the IMF require continued access to its credit facilities, and so these countries must satisfy any budget deficit

targets agreed upon mutually. The IMF programs only specify an overall budget deficit target to avoid the appearance of blatant political interference in the allocation of government resources among competing demands by different groups within a country. The country authorities must then decide how to achieve the target budget deficits. As the analytical result shows below, any deficit target can be met by new bond issues, but developing countries with IMF programs in place must adjust government spending to satisfy budget constraints while they continue maintaining independent domestic credit ceilings.[7] Political difficulties in cutting expenditures on social programs make it almost certain that these countries will first trim programmed capital or capital maintenance expenditures. The temporary gains made in lower budget deficits are lost when countries are no longer subjected to IMF monitoring. When the balance of payments difficulties become less serious, these countries expand expenditures in curtailed areas to prevent further deterioration in their capital stock and thereby raise the budget deficit with eventual re-emergence of macroeconomic imbalances.

The process that ensures target budget deficits are satisfied is also similar in the U.K. and in the U.S. In the U.K., successive budget deficit targets were satisfied initially by increased revenue flows from the North Sea oil and gas production. Proceeds from selling government assets also helped to lower the published deficits and contributed to halting the rapid growth in the consolidated central government debt. In recent years, as the oil sector weakened and tax revenue performance deteriorated, the government reduced

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[7]The policy package raises an interesting problem for policymakers and advisors. The choice of domestic credit ceilings and endogenous issuance of bonds to satisfy budget deficits may not clear the often thin government securities markets as the independent path for credits will result generally in a market interest rate different from the government securities market-clearing interest rate.

expenditures to satisfy its budget constraint. In the U.S., the law provides for an automatic trigger mechanism in the form of sequestration involving projected expenditure cuts to facilitate achieving projected budget deficit levels. Sequestration is an automatic deficit-reduction procedure established by the U.S. Congress in 1985 and it applies if a projected deficit exceeds the target amount in the Act. In this tougher budget enforcement process, the President presents a budget with a deficit aimed at the target deficit by making changes in any of revenue or expenditure.[8] Congress has between January and September to make any changes. If, on September 1, Congress does not agree on the target deficit figure, the President has to issue the Sequester Order. Then Congress has until October 1 to undo any sequestration the President says he will do. If no agreement is reached between Congress and the President, the Sequester Order is implemented on all non-exempted government expenditures. Congress has now exempted two-thirds of government expenditure from any Sequester Order and introduced "creative" accounting techniques[9] that have diminished the effectiveness of the deficit targets. Nevertheless, the process raises the deficit issue annually for public discussions. Also, through the provision of the Sequester Order, it is recognized that government expenditures may have to be adjusted in order to satisfy the government budget constraint, while endogenous issue of bonds will satisfy the deficit target.

The analytical result presented in this paper has an important message for the current budgetary debate in the U.S.A. as well as for debates in developing

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[8]Note, the emphasis is on cuts to achieve budget deficits rather than satisfying the government budget constraint.

[9]Creative accounting techniques include the inclusion of the Social Security Trust Funds and the exclusion of Postal System, as well as the creation of a shell company to borrow for the purpose of the savings and loans bailout, with a view to obtaining a smaller projected budget deficit to minimize the application of the Sequester Order.

countries. If the President will not accept tax increases and the Congress will not accept cuts in discretionary government spending, reduced budget deficits as required by the Gramm-Rudman-Hollings law cannot be achieved. Attempts by these two branches of the U.S. government to show that the law is satisfied by creative accounting will not reduce the large budget deficits. In the developing countries that adopt IMF-supported financial programs, policymakers and the political leadership must understand that budget deficit reductions necessarily imply sustained expenditure cuts or improved government receipts through better tax administration. If prospects for higher tax receipts are slim, then there is no alternative to reducing discretionary government spending short of reneging on outstanding government debt or money financing with the prospect of rapid inflation rates. Therefore, in countries that have serious structural imbalances, political leaderships need to prepare the voters psychologically for sustained cuts in government spending. This may prevent unpleasant surprises for governments that seriously attempt to reduce budget deficits. The downfall of the Seaga government in Jamaica in the 1989 general election and the repeated coup attempts in Nigeria against the Babandiga government are two examples of popular responses to successful reductions of budget deficits obtained in periods of crisis by drastic reductions in discretionary government spending. A better appreciation of the policy limitations imposed by the typical financial program will facilitate early attempts at gradual reductions in discretionary government spending that may prevent "knee-jerk" reactions by the voters.

I have organized the paper as follows. In section 2, I specify a financial program consisting of a government budget constraint, a budget deficit target, and an independent path for the money supply. In section 3, I describe the private economy which simultaneously interacts with the financial program of the

government sector to determine the macroeconomic outcomes. The private sector consists of market efficiency conditions for money, capital, and interest-bearing securities and the goods market-clearing condition. In section 4 and in the Appendix, I address the question of the feasibility of the financial program by identifying the policy variables that must be endogenously determined to satisfy the financial program. I demonstrate that the feasibility is nontrivial by establishing that the economic variables have unique values both in the steady state and along the dynamic convergent path. Finally, I make concluding remarks in section 5.

2. A Financial Program

I address the issues discussed in the previous section as the feasibility of a financial program consisting of a government budget constraint, a budget deficit target, and an independent path for the money supply. I analyze such a program in a closed economy where (a) the government is not engaged in investment expenditures and (b) the government's revenues are generated costlessly from the issuance of base money, interest-bearing securities issued as perpetuity bonds, and the collection of lump sum and marginal taxes on private incomes.

Because the government budget deficit is equal to the excess of government spending plus net interest payments over tax revenue, the government budget constraint is simply the requirement that any deficit must be financed either by issuing money or bonds. At each instant, this requirement implies that

$$g + (1-t)eb - \tau - tf(k) = \dot{m} + q\dot{b} + (m+qb)\pi. \qquad (1)$$

The left hand side of this equation is the real budget deficit while the right side is an indication that this deficit may be financed by either issuing real money ($\dot{M}/P$) or real bonds ($q\dot{B}/P$). The variables are defined as follows:

g = real government spending, t = marginal tax rate, e = nominal coupon payment on a bond, $b \equiv B/P$ = real bonds, B = number of bonds, P = price of goods, τ = lump sum tax, f(k) = production as a function of capital to labor ratio (k), $m \equiv M/P$ = real money balance, q = price of a real bond (b), and $\pi \equiv \dot{P}/P$ = fully anticipated rate of inflation. In this specification of the government budget, government policy decisions relate to five variables. These are real government spending (g), real taxes (t and τ), monetary policy (M), and bond issues (B).

Literature addressing government budget constraint has now established that at most four of these preceding policy variables may be chosen independently and the fifth then determined to balance the government budget, given the structure of the economy and its agents' preferences. The second specification in a financial program involving an additional constraint imposed through a restriction on the size of the budget deficit will place a further limitation on the government's ability to choose freely its policy variables. It does not matter analytically whether this restriction on deficit is specified in levels or in ratio to gross domestic product. Consider

$$g + (1-t)eb - \tau - tf(k) = Rf(k), \quad R > 0. \tag{2}$$

Equation (2) indicates that the budget deficit ratio is required to be some arbitrary ratio R. This type of formulation is more common in the IMF-supported financial programs introduced in the developing countries. In the U.K., the MTFS includes a deficit target such as (2) with R declining over time. In the U.S., the Gramm-Rudman-Hollings law targets reductions initially in the forecast deficit levels and R = 0 in fiscal year 1993. Equation (2) may be used in analyzing the <u>feasibility</u> of all financial programs, including the U.S. program.

Finally, an independent monetary policy requires specifying a path for the money supply. If nominal money grows at a constant rate θ and at the initial

date the outstanding nominal money stock (M_0) is predetermined, then real money balances grow according to

$$\dot{m} = (\theta - \pi)m. \tag{3}$$

In the developing countries with IMF programs, the target is specified on domestic credits rather than on money supply directly. But, by assumption in this paper, monetary institutions can not have any foreign assets or liabilities. So, domestic credit equals to total liabilities plus net worth. Since total assets must equal total liabilities plus net worth of all monetary institutions, and the money supply is only a subset of total liabilities, equation (3) remains useful in addressing the question of setting a ceiling on domestic credits. In the U.K., θ has been specified for inside money as well as, since 1984, outside money (M0) that is close to the definition of M in this paper. The MTFS specified a declining θ over time. In the U.S., θ is determined by decisions taken by the FOMC of the Federal Reserve System and it is not directly controlled by the fiscal authorities.

3. The Private Economy

A financial program consisting of equations (1) to (3) is satisfied by the simultaneous interactions with private behavioral equations as well as the goods market-clearing condition. A Sidrauski-Brock optimizing model over an infinite horizon and under perfect foresight provides the following familiar conditions for private behavior (see Begg and Haque (1984) or Fischer (1979)):

$$\text{Money market:} \quad U_m = U_c(r+\pi) \tag{4}$$

$$\text{Capital market:} \quad (1-t)f'(k) = r + \delta, \text{ and} \tag{5}$$

$$\text{Euler equation:} \quad -\dot{U}_c/U_c = r - \phi \tag{6}$$

Notations U_m and U_c denote marginal utility of money (m) and consumption (c), respectively. r is the real implicit return on long bonds, δ is the rate of

capital depreciation, $f'(k)$ is the marginal product of capital, and ϕ is the pure rate of time preference. The preceding optimal behavioral equations are augmented by the following securities market efficiency condition when government securities are introduced as an alternative form of financial assets in the private portfolio:

$$\dot{q}/q + (1-t)e/q = r + \pi. \tag{7}$$

To analyze the feasibility of the financial program specified in Section 2, I complete the model specification by assuming that the goods market clears. That is, output is divided among private and government consumption and gross investment as in equation (8).

$$f(k) = c + g + \dot{k} + \delta k. \tag{8}$$

4. The Feasibility Problem

The feasibility of the financial program is assured if the model represented by equations (1) to (8) has a unique forward-looking path as its solution. The necessary and sufficient conditions for this path being unique are that there exist unique steady state values, a convergent subspace in the equations system that describes the dynamic evolution of the economy, and an exact number of initial conditions to tie down a unique point in the convergent subspace.

Denote the steady state values by superscript *. I assume the real money stock is constant in the steady state so the perfectly anticipated inflation rate equals the rate of nominal money growth (see equation 3) -- i.e.,

$$\pi^* = \theta. \tag{9}$$

From equation (6), the real interest rate is equal to the rate of pure time discount:

$$r^* = \phi \tag{10}$$

because I assume real consumption and real money balances are constant. Equation (5) then implies

$$(1-t)f'(k^*) = \phi + \delta \tag{11}$$

and so this modified golden rule establishes a unique capital stock. Because the nominal interest rate $(\phi + \theta)$ and the coupon payment on bonds (e) are constant, the bond price q^* must be constant. Indeed, from equation (7),

$$q^* = (1-t)e/(\phi+\theta). \tag{12}$$

Since real wealth must be constant, and q^* is constant, it follows that

$$\dot{b} = 0. \tag{13}$$

The expression for the goods market clearing condition is:

$$f(k^*) = c^* + g + \delta k^* \tag{14}$$

and it determines a unique private consumption level c^*, given the level of real public spending and the rate of capital depreciation.[10]

With a unique real consumption (c^*), demand for real money balances (m^*) is then solved from the money market condition (15) (obtained from equation (4)).

$$U_m(c^*,m^*)/U_c(c^*,m^*) = \phi + \theta. \tag{15}$$

But, because this condition is nonlinear, m^* *may* have multiple solutions. The following analysis establishes that, provided money and consumption are normal or inferior goods and remain so for all feasible solutions, then the money market condition solves for a unique m^*. The slope of the money market condition in the (c,m)-plane is

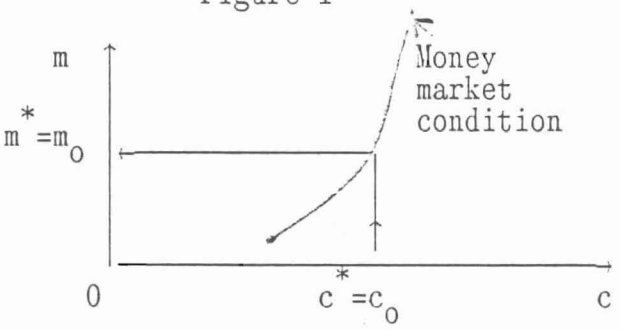
$$\frac{dm^*}{dc^*} = - J_1/J_2, \tag{16}$$

where $J_1 \equiv (U_{cm}U_c - U_{cc}U_m)/U_c^2$ and $J_2 \equiv (U_{mm}U_c - U_{cm}U_m)/U_c^2$.

[10]Condition (14) also shows that private consumption in the steady state is positive provided that output net of capital depreciation exceeds public consumption of goods and services.

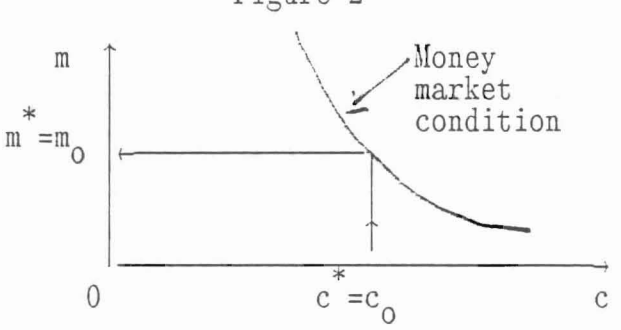
Both J_1 and J_2 are evaluated at their steady state values. Restrictions $J_1 > 0 > J_2$ ensure money and consumption are normal goods (see Fischer, 1979). Thus, the slope dm^*/dc^* is negative. Figures 1 and 2 show the graph for the money market condition, under the assumption of both normal or inferior goods. In two possible cases, given a unique $c^* = c_0$ the money market condition provides a unique $m^* = m_0$.

Figure 1



Money and consumption are normal goods or both are inferior.

Figure 2



Either money or consumption is an inferior good.

Thus, even though the money market condition is nonlinear, m^* is unique under the standard assumption that money and consumption goods are normal.

There remain expressions for the government budget constraint and the budget deficit targets:

$$m^*\theta = g - \tau - tf(k^*) + \phi(1-t)eb^*/(\phi+\theta) \tag{17}$$

$$Rf(k^*) = g - \tau - tf(k^*) + (1-t)eb^*. \tag{18}$$

The knowledge of k^*, m^*, q^* and the constant parameters is sufficient to solve for a unique real bond stock b^* from the government budget constraint, simultaneously satisfying itself and the private sector's optimal behavioral equations. The real bond stock thus obtained must be unique precisely because

the equation is linear in the unknown.[11] However, unique values of the capital stock and the number of bonds will not generally satisfy the steady state version of the real budget deficit target, equation (18). Hence, given a real budget deficit target, it is not generally feasible to set independent paths for government spending, taxes, and the money supply. At least one must be determined endogenously, together with the number of bonds. If the marginal tax rate is specified as an endogenous policy variable, then it is not possible to rule out multiple perfect foresight paths because the steady state values are not unique in general. Instead, either real government spending or lump sum taxes must be made endogenous. In the formulation of this paper, these two have qualitatively similar steady state and dynamic stability properties because government spending does not enter the utility function in a nonlinear fashion.

To show how a real stock of bonds b^* and lump sum tax τ^* or discretionary government spending g^* are chosen to balance the government budget and satisfy the budget deficit target, substitute for τ or g from the government budget constraint into (17) to obtain

$$Rf(k^*) = \theta(m^* + q^* b^*). \tag{19}$$

With k^*, m^*, q^* already solved, the preceding equation determines b^* given the steady state fiscal deficit $Rf(k^*)$. In particular,

$$b^* = [\frac{Rf(k^*)}{\theta} - m^*]/q^*.$$

By substituting this unique value of b^* in the government budget constraint (16), the following equation is obtained:

$$g + \phi Rf(k^*)/\theta = (\phi + \theta)m^* + \tau + tf(k^*).$$

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[11] From equation (17), the real bond stock is positive if total government revenue, inclusive of inflation tax, exceeds government expenditure on goods and services. At an intuitive level, a positive real bond stock consistent with a steady state is possible if the government's tax revenue is sufficient to finance interest payments on a constant real stock of perpetuity bonds.

This equation then determines a unique g^* or τ^* to satisfy the government budget constraint.

The establishment of unique steady state values in the preceding analyses confirms that a financial program similar to the MTFS in the U.K., the Gramm-Rudman-Hollings deficit reduction program in the U.S., and the IMF-supported programs in developing countries are feasible with bond issues and lump sum taxation or government spending as two simultaneous endogenous policy decisions.[12] I show in the Appendix that dynamic stability is ensured for an optimizing monetary model in which lump sum taxes or discretionary government spending change endogenously to satisfy the government budget balance and, given this, the bond issues are endogenous to satisfy the budget deficit target. In this sense, something akin to the MTFS, the Gramm-Rudman-Hollings law, and IMF programs in developing countries are desirable. The budget deficit target ensures that the real bond stock cannot explode because it implies a fixed path for government spending inclusive of interest payments. This is the crucial mechanism for dynamic stability in this framework, as is the case in ad hoc extended IS/LM models.[13]

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[12]This feasibility will not in general extend to the case of indexed coupon payments on government bonds. The compensation offered to economic agents for inflation implies that there is no inflation tax on bonds (i.e., $\theta q^* b^*$ does not appear in equation (19)). This means that in the steady state the inflation tax on money (θm^*) must equal the real budget deficit which in turn must equal $Rf(k^*)$. With k^*, m^*, and θ following a constant path, R cannot then be an exogenous variable.

[13]When coupon values are fixed in nominal terms, Haque (1985) shows that simple endogenous bond finance in optimizing monetary growth models of the type adopted in this paper are dynamically unstable: a similar result can also be derived with extended IS/LM models.

5. Concluding Remarks

I analyzed in this paper a typical financial program found commonly in developing countries that are engaged in improving structural imbalances with assistance from the International Monetary Fund. Similar programs have also been adopted in industrialized countries, in the United Kingdom since 1980 and in the United States since 1984. The typical financial program consists of a target budget deficit, an independent monetary or domestic credit policy, and a government budget constraint. By considering a private sector whose behavioral equations are derived from an optimizing monetary growth model, I show that such a financial program is feasible, provided bonds are issued endogenously to satisfy the budget deficit target and either lump sum taxes and/or discretionary government spending are adjusted endogenously to satisfy the government budget constraint. Lump sum taxes are not dissimilar from U.K. government receipts from North Sea oil and gas production or proceeds from selling government assets. But most countries with a financial program do not have ready access to such receipts, so they must use discretionary government spending and issue bonds endogenously to satisfy the typical financial program. Given this fact, countries that intend to reduce budget deficits must accept cuts in discretionary government spending and/or raise taxes. If taxes are not raised or spending is not cut, budget deficit targets cannot be maintained.

Appendix: Dynamic Stability

The dynamic path is examined by linearizing the behavioral equations, the money supply rule, the government budget constraint, and the real budget deficit target in the neighborhood of the unique steady state equilibrium. Differential equations system (A1) and static equations (A2) and (A3) are obtained from equations (1) - (8). Denoting vector transpose by T, the following notation is adopted:

$$x^T = (k,c,m,q,b) \qquad \hat{x} = x - x^* \qquad \dot{x} = d/ds(\hat{x}).$$

$$\begin{bmatrix} \dot{k} \\ \dot{c} \\ \dot{m} \\ \dot{q} \\ \dot{b} \end{bmatrix} = \begin{bmatrix} (\phi+\delta t)/(1-t) & -1 & 0 & 0 & 0 \\ -F(D+Em^*) & Em^*J_1 & Em^*J_2 & 0 & 0 \\ Fm^* & -m^*J_1 & -m^*J_2 & 0 & 0 \\ 0 & q^*J_1 & q^*J_2 & (\phi+\theta) & 0 \\ Fb^*+Rf'/q^* & -b^*J_1 & -b_2^*J_2-\theta/q^* & -\theta b^*/q^* & -\theta \end{bmatrix} \begin{bmatrix} \hat{k} \\ \hat{c} \\ \hat{m} \\ \hat{q} \\ \hat{b} \end{bmatrix} \qquad \text{(A1)}$$

where $D \equiv U_c^*/U_{cc}^*$, $E \equiv U_{cm}^*/U_{cc}^*$, $F \equiv (1-t)f'$, $f'' = d/dk(f'(k))$, and J_i's ($i = 1,2$) are evaluated at the steady state values. The solutions obtained for $(\hat{k},\hat{c},\hat{m})$ are then used to solve for $\hat{r}$ and $\hat{\pi}$ in the following equations.

$$\hat{r} = F\hat{k} \qquad \text{(A2)}$$

$$\hat{\pi} = J_1\hat{c} + J_2\hat{m} - \hat{r}. \qquad \text{(A3)}$$

The triangular structure of the coefficient matrix in the differential equations system (A1) shows that two eigenvalues are: $-\theta$ (negative provided $\theta > 0$) and $\phi + \theta$ (positive). The remaining three eigenvalues are obtained from the top left hand side 3x3 submatrix, whose determinant is negative while the

trace is positive. Hence the 5x5 differential system has exactly two negative and three positive eigenvalues and is a regular saddlepath if, and only if, there are exactly two initial conditions. Private consumption (c), price of bonds (q), and the price of goods are endogenous and capable of instantaneous jumps. Nominal money and the number of bonds are instantaneously predetermined. Although their real values may take on any value at the initial date, the jump in the price level cannot alter the money-to-bond ratio and this imposes one initial condition. The inherited capital stock k_0 (the outcome of previous investment decisions) is a second initial condition. Thus, under budget deficit and monetary targets, endogenous issuance of bonds and lump sum taxes or discretionary government spending, the economy is characterized by a regular saddlepath and it proceeds along its unique self-fulfilling forward-looking convergent path to the steady state from the initial date on.

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